

WHAT IS CLAIMED IS:

1. A semiconductor device comprising at least a pixel portion and a driver circuit portion, said semiconductor device comprising a plurality of TFTs and each of TFTs

5 comprising:

a semiconductor layer formed on an insulating surface;

an insulating film formed on the semiconductor layer; and

a gate electrode formed on the insulating film.

wherein the pixel portion comprises at least one p-channel TFT and the  
10 driving circuit portion has at least an n-channel TFT and a p-channel TFT,

wherein a gate electrode of the n-channel TFT of the driving circuit portion has a laminate structure with a first conductive layer as a lower layer and a second conductive layer as an upper layer, the first conductive layer having a first width and a second conductive layer having a second width that is narrower than the first width.

15 and

wherein a gate electrode of the p-channel TFT of at least the pixel portion has a laminate structure comprising a first conductive layer and a second conductive layer, the first conductive layer and the second conductive layer having the same width.

20

2. A device according to claim 1, wherein edge of the first conductive layer of the n-channel TFT of the driving circuit portion is tapered in section.

3. A device according to claim 1, wherein the p-channel TFT of the pixel portion  
25 comprises a plurality of channel formation regions.

4. A device according to claim 1, wherein in the n-channel TFT of the driving circuit portion, the gate electrode has a tapered portion, and the semiconductor layer comprises a channel forming region overlapping the gate electrode and an impurity region partially overlapping the gate electrode.

5

5. A device according to claim 4, wherein the impurity region of the n-channel TFT has a region that has an impurity concentration gradient in a range of at least  $1 \times 10^{17}$  to  $1 \times 10^{22}$  atoms/cm<sup>3</sup>, and the impurity concentration thereof increases as the distance from the channel forming region increases.

10

6. A device according to claim 4, wherein the impurity region of the n-channel TFT includes a source region or a drain region.

7. A device according to claim 1, wherein the p-channel TFT of at least the pixel region has an LDD region between one channel forming region and a source region, or between the channel forming region and a drain region in the semiconductor layer.

8. A device according to claim 1, wherein the p-channel TFT of at least the pixel region has an offset region between a channel forming region and a source region, or between the channel forming region and a drain region in the semiconductor layer.

9. A device according to claim 1, wherein a gate wiring line is formed on an insulating film that covers the gate electrode in the pixel portion, and wherein the gate wiring line and a pixel electrode connected to the impurity region of the p-channel

TFT of the pixel portion comprise the same material.

10. A device according to claim 1, wherein a source wiring line is formed on a first insulating film that covers the gate electrode in the pixel portion, wherein an  
5 electrode connected to the impurity region of the of the p-channel TFT of the pixel portion is formed on a second insulating film that covers the source wiring line, and wherein the electrode and a pixel electrode comprise the same material.

11. A device according to claim 1, wherein the semiconductor device is at least  
10 an electric equipment selected from the group consisting of a video camera, a digital camera, a navigation system for automobiles, a personal computer, a portable information terminal, a digital video disc player, or an electronic game machine.

12. A semiconductor device comprising at least a pixel portion and a driver  
15 circuit portion, said semiconductor device comprising a plurality of TFTs and each of TFTs comprising:

a semiconductor layer formed on an insulating surface;

an insulating film formed on the semiconductor layer; and

a gate electrode formed on the insulating film.

20 wherein the pixel portion comprises at least one p-channel TFT and the driving circuit portion has at least an n-channel TFT and a p-channel TFT.

wherein in the p-channel TFT of the pixel portion, the gate electrode has a tapered portion, and the semiconductor layer comprises a plurality of channel forming regions overlapping the gate electrode and an impurity region partially  
25 overlapping the gate electrode, and

wherein in the n-channel TFT of the driving circuit portion, the gate electrode has a tapered portion, and the semiconductor layer comprises a channel forming region overlapping the gate electrode and an impurity region partially overlapping the gate electrode.

5

13. A device according to claim 12, wherein a gate wiring line is formed on an insulating film that covers the gate electrode in the pixel portion, and wherein the gate wiring line and a pixel electrode connected to the impurity region of the p-channel TFT of the pixel portion comprise the same material.

10

14. A device according to claim 12, wherein a source wiring line is formed on a first insulating film that covers the gate electrode in the pixel portion, wherein an electrode connected to the impurity region of the of the p-channel TFT of the pixel portion is formed on a second insulating film that covers the source wiring line, and  
15 wherein the electrode and a pixel electrode comprise the same material.

15. A device according to claim 12, wherein the semiconductor device is at least an electric equipment selected from the group consisting of a video camera, a digital camera, a navigation system for automobiles, a personal computer, a portable  
20 information terminal, a digital video disc player, or an electronic game machine.

16. A semiconductor device comprising at least a pixel portion and a driver circuit portion, said semiconductor device comprising:

a semiconductor layer formed on an insulating surface, the semiconductor  
25 layer comprising at least one channel forming region and impurity regions:

a gate electrode formed adjacent to the semiconductor layer with a gate insulating film interposed therebetween, the gate electrode having a laminate structure with a first conductive layer as a lower layer and a second conductive layer as an upper layer;

5 an insulating film formed over the gate electrode; and

a gate wiring line formed on an insulating film,

wherein the pixel portion comprises at least one p-channel TFT and the driving circuit portion has at least an n-channel TFT and a p-channel TFT,

10 wherein, in the gate electrode of the n-channel TFT of the driving circuit portion, the first conductive layer having a first width and the second conductive layer having a second width that is narrower than the first width, and

wherein, in the gate electrode of the p-channel TFT of the pixel portion at least, the first conductive layer and the second conductive layer having the same width, and

15 wherein the gate wiring line comprises the same material a pixel electrode connected to the impurity region of the p-channel TFT of the pixel portion comprise the same material

17. A device according to claim 16, wherein the semiconductor device is at least  
20 an electric equipment selected from the group consisting of a video camera, a digital camera, a navigation system for automobiles, a personal computer, a portable information terminal, a digital video disc player, or an electronic game machine.

18. A semiconductor device comprising at least a pixel portion and a driver  
25 circuit portion, said semiconductor device comprising:

a semiconductor layer formed on an insulating surface, the semiconductor layer comprising at least one channel forming region and impurity regions;

a gate electrode formed adjacent to the semiconductor layer with a gate insulating film interposed therebetween, the gate electrode having a laminate structure with a first conductive layer as a lower layer and a second conductive layer as an upper layer;

a first insulating film formed over the gate electrode;

a source wiring line formed on a first insulating film; and

a second insulating film formed on the source wiring line,

wherein the pixel portion comprises at least one p-channel TFT and the driving circuit portion has at least an n-channel TFT and a p-channel TFT,

wherein, in the gate electrode of the n-channel TFT of the driving circuit portion, the first conductive layer having a first width and the second conductive layer having a second width that is narrower than the first width, and

wherein, in the gate electrode of the p-channel TFT of the pixel portion at least, the first conductive layer and the second conductive layer having the same width, and

wherein the pixel region further comprises an electrode formed on the second insulating film and connected to the impurity region of the of the p-channel TFT of the pixel portion; and a pixel electrode formed on the second insulating film and comprising the same material as said electrode.

19. A device according to claim 18, wherein the semiconductor device is at least an electric equipment selected from the group consisting of a video camera, a digital camera, a navigation system for automobiles, a personal computer, a portable

information terminal, a digital video disc player, or an electronic game machine.

20. A method of manufacturing a semiconductor device comprising steps of:

forming a first semiconductor layer and a second semiconductor layer on  
5 an insulating surface;

forming an insulating film on the first semiconductor layer and the second  
semiconductor layer;

forming a first gate electrode on the insulating film, the first gate electrode  
having a tapered portion;

10 doping the first semiconductor layer with an impurity element that imparts  
an n type conductivity using the first gate electrode as a mask to form an n type  
impurity region;

forming a second gate electrode through selective removal in which only  
the tapered portion of the first gate electrode above the second semiconductor layer  
15 is removed; and

doping the second semiconductor layer with an impurity element that  
imparts a p type conductivity using the second gate electrode as a mask to form a p  
type impurity region,

wherein an n-channel TFT comprises the first semiconductor layer and the  
20 first gate electrode, a p-channel TFT comprises the second semiconductor layer and  
the second gate electrode.

21. A method according to claim 20, wherein the first gate electrode has a  
laminate structure with a first conductive layer as a lower layer and a second  
25 conductive layer as an upper layer, the first conductive layer having a first width and

a second conductive layer having a second width that is narrower than the first width.

22. A method according to claim 21, wherein a region of the first conductive layer that does not overlap the second conductive layer is tapered in section.

5

23. A method according to claim 20, wherein, in the step of forming the n type impurity region, the first semiconductor layer is doped with the impurity element that imparts the n type conductivity through the tapered portion of the first gate electrode to form an impurity region whose impurity concentration increases toward edge of the tapered portion.

10

24. A method according to claim 20, further comprising steps of:

forming a first insulating film so as to cover the first and second gate electrodes;

15

forming a source wiring line on the first insulating film:

forming a second insulating film that covers the source wiring line; and

forming a gate wiring line on the second insulating film.

25. A method according to claim 20, wherein the n-channel TFT and the p-channel TFT a driving circuit portion are formed in a driver circuit portion of the semiconductor device.

20

26. A method according to claim 20, wherein the p-channel TFT is formed in a pixel portion of the semiconductor device.

25



27. A method according to claim 20, wherein the semiconductor device is at least an electric equipment selected from the group consisting of a video camera, a digital camera, a navigation system for automobiles, a personal computer, a portable information terminal, a digital video disc player, or an electronic game machine.

5

28. A method of manufacturing a semiconductor device comprising steps of:

forming a first semiconductor layer and a second semiconductor layer on an insulating surface;

forming an insulating film on the first semiconductor layer and the second semiconductor layer;

forming a first gate electrode on the insulating film, the first gate electrode having a tapered portion;

doping the first semiconductor layer with an impurity element that imparts an n type conductivity using the first gate electrode as a mask to form an n type impurity region;

doping the second semiconductor layer with an impurity element that imparts a p type conductivity using the first gate electrode as a mask to form a p type impurity region; and

forming a second gate electrode by selectively removing only the tapered portion of the first gate electrode above the second semiconductor layer,

wherein an n-channel TFT comprises the first semiconductor layer and the first gate electrode, a p-channel TFT comprises the second semiconductor layer and the second gate electrode.

29. A method according to claim 28, wherein the second semiconductor layer

is doped with the impurity element that imparts the p type conductivity through the tapered portion of the first gate electrode to form an impurity region whose impurity concentration increases toward edge of the tapered portion.

5        30. A method according to claim 28, wherein the first gate electrode has a laminate structure with a first conductive layer as a lower layer and a second conductive layer as an upper layer, the first conductive layer having a first width and a second conductive layer having a second width that is narrower than the first width.

10       31. A method according to claim 30, wherein a region of the first conductive layer that does not overlap the second conductive layer is tapered in section.

15       32. A method according to claim 28, wherein, in the step of forming the n type impurity region, the first semiconductor layer is doped with the impurity element that imparts the n type conductivity through the tapered portion of the first gate electrode to form an impurity region whose impurity concentration increases toward edge of the tapered portion.

20       33. A method according to claim 28, further comprising steps of:  
forming a first insulating film so as to cover the first and second gate electrodes;  
forming a source wiring line on the first insulating film;  
forming a second insulating film that covers the source wiring line; and  
forming a gate wiring line on the second insulating film.

25

34. A method according to claim 28, wherein the n-channel TFT and the p-channel TFT a driving circuit portion are formed in a driver circuit portion of the semiconductor device.

5        35. A method according to claim 28, wherein the p-channel TFT is formed in a pixel portion of the semiconductor device.

36. A method according to claim 28, wherein the semiconductor device is at least an electric equipment selected from the group consisting of a video camera, a digital camera, a navigation system for automobiles, a personal computer, a portable information terminal, a digital video disc player, or an electronic game machine.

10